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ABSTRACT

This report examines the decline in the number of medical students choosing generalist or primary care specialties, along with the efficacy of strategies designed to encourage students to choose generalist and primary care training. Based on surveys of college and medical school students, residents, and medical schools, the study focused on: (1) the characteristics associated with students who are more likely to choose generalist or primary care specialties in medical school; (2) curriculum requirements that expose medical students and residents to primary care training; and (3) the role federal financing plays in setting the focus of medical education. Although the strongest predictor of whether students would choose primary care careers was their stated preference for primary care before they entered medical school, the study found that some features of medical schools, such as the existence of a family practice department, were associated with an increased likelihood that students would go into primary care. Four appendixes provide information on personal and institutional characteristics associated with choice of primary care residency program, public health service funding of medical education, survey methodology for medical school and residency surveys, and General Accounting Office contacts and staff acknowledgements. (Contains 45 references.) (MDM)

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GAO

United States
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Health, Education, and
Human Services Division

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October 21, 1994

The Honorable David H. Pryor
Chairman
The Honorable William S. Cohen
Ranking Minority Member
Special Committee on Aging
United States Senate

The Honorable John Conyers, Jr.
Chairman
Committee on Government Operations
House of Representatives

Since 1960, the proportion of primary care physicians—family and general practice physicians, general internists, and general pediatricians—has dropped from about 53 percent to about 35 percent of the nation's active physicians. Taking into account current health care trends emphasizing a growing need for primary care medicine, the Department of Health and Human Services (HHS) projects for the year 2000 a shortage of 35,000 generalist or primary care physicians.[1] The decline in the proportion of active primary care physicians is related to career decisions that students make during their medical school years and later in residency training. While no single factor can explain why students pursue primary care or nonprimary care specialties, various studies indicate that the characteristics of students entering medicine and the educational process they experience may influence career decisions.

The federal government contributes to the financing of medical education and training in several ways. In 1992, the Medicare program provided a total of about $5.2 billion in support of graduate medical education.[2] Through its funding of biomedical research, the National Institutes of Health helps support medical education at the undergraduate and graduate levels. The federal government also supports medical education and

[1]This projection assumes no changes in the current system of medical training and a health care system dominated by managed care arrangements. More specifically, it is assumed that two-thirds of the U.S. population will be enrolled in some type of managed care arrangement with strong utilization controls, whether a staff model health maintenance organization, independent practice association, or a network. (See Council on Graduate Medical Education, Fourth Report: Recommendations to Improve Access to Health Care Through Physician Workforce Reform, U.S. Department of Health and Human Services, Jan. 1994.)

[2]The federal government also contributes to the financing of graduate medical education through programs administered by the Department of Veterans Affairs, the Department of Defense, and through federal sharing in states' costs of the Medicaid program.

training activities through various programs authorized under the Public Health Service Act.

Concerned about the declining ratio of primary care physicians to nonprimary care physicians, you asked us to assess the role of medical education in physician specialty choice. You also asked us to assess how federal financing of medical education may influence career choices.

More specifically, we focused on the

- characteristics associated with students who are more likely to choose generalist or primary care specialties in medical school,
- curriculum requirements that expose medical students and residents to primary care training, and
- the role federal financing plays in setting the focus of medical education.

Results in Brief

Choice of career paths in medicine is associated with the characteristics of students admitted to medical schools and with the curriculum and training opportunities they receive during their medical education.

Although the strongest predictor of whether students would choose primary care careers was their stated preference for primary care before they entered medical school,[3] we found that some features of medical schools were associated with an increased likelihood that students would go into primary care. Foremost among these was whether the medical school had a family practice department—students who attended schools with family practice departments were more likely to pursue primary care than students who attended schools without such departments. Other factors moderately favoring primary care were whether a family practice clerkship was required before career decisions were made in the fourth year and how well family practice departments were funded.

Similarly, once students graduate from medical school and enter residency programs, we found a significant association between program opportunities to expose residents to primary care faculty and the proportion of residents choosing generalist practice.

Although curriculum and training opportunities appear to influence student choice of primary care, we found that many medical schools did not require primary care experiences before students chose residency

[3]We did a logistic regression that is discussed on pp. 7-8, and more fully in app. I, pp. 30-32.

programs. Moreover, once in a residency program, residents spent only a small portion of training time on providing primary care or working in a primary care setting.

The way residency training is financed contributes to a specialist orientation for the clinical education of medical students. Only hospitals or hospital-affiliated providers are eligible to receive Medicare payments for direct training costs. Current financing mechanisms for residency training can give greater incentives to training in nonprimary care-oriented settings than in primary care-oriented settings. This can place primary care residency programs at a disadvantage because of their use of nonhospital settings for training. In our view, the Medicare payment methodology may need to be modified to provide incentives for training in nonhospital settings.

Background

Medical career decisions are usually made at three specific points during the educational continuum: (1) at the end of college when students typically apply to medical school, (2) during the fourth year of medical school when students elect the area of medicine to pursue and enter residency training, and (3) at the end of residency training when residents decide to enter practice or to train further for a subspecialty.

College students who choose to pursue a career in medicine take the Medical College Admission Test (MCAT) and apply to medical schools. At that early point in the educational continuum, some students express a preference for a primary care or nonprimary care specialty.[4]

During the 4 years of medical school, students are instructed in the basic sciences and learn about the major medical disciplines through clinical training.[5] Clinical training usually includes preceptorships, in which medical students observe a physician in practice, and clerkships, in which third- and fourth-year medical students participate with medical residents and faculty in the diagnosis and treatment of patients. During the fourth year of medical school, students formally select the specialty area they are interested in by applying directly to residency training programs. This process is facilitated by the National Resident Matching Program, through

[4]Individuals registering for the MCAT also complete a short survey—the Premedical Student Questionnaire—detailing demographic characteristics, their personal background, reasons for wanting to study medicine, and specialty preference.

[5]The basic sciences include the subjects of anatomy, biochemistry, physiology, microbiology, pharmacology, and pathology. The medical disciplines include disciplines such as internal medicine, pediatrics, family medicine, psychiatry, and obstetrics/gynecology.

which student choices for residency training programs are matched with available positions and the preferences of program directors for candidates.[6] Several experts suggest that educational experiences and the role models encountered during the first 3 years of medical school are among the factors that influence the career choices of medical students.

After students graduate from medical school, they enter residency programs that prepare them for independent practice in the chosen specialty areas largely through on-the-job training. This training traditionally takes place in teaching hospitals.[7] Residency training generally comprises required and elective rotations and can include continuity of care assignments.[8] Through these training experiences, residents treat patients under the supervision of teaching physicians. Residency training continues for 3 to 7 years depending on the discipline. In some disciplines, residents who complete general residency training may enter practice or may further subspecialize. For example, a resident who completes training in general internal medicine may decide to enter practice or to pursue further training in cardiology, a subspecialty of internal medicine that focuses on the heart.

Primary Care Medicine Involves a General Body of Knowledge

Primary care is delivered by family and general practice physicians, general internists, and general pediatricians.[9] These physicians are broadly trained to evaluate a spectrum of undifferentiated health problems, manage acute and chronic conditions, and address disease prevention and health promotion. The focus of primary care is not organ-specific, as is the focus of such specialties as cardiology or nephrology. Primary care is also characterized by care that is comprehensive and continuous, requires broad diagnostic skills, and is usually practiced in ambulatory settings such as physician offices or clinics. Coordinating a patient's overall care,

[6]Residency programs may be categorized as programs that, in practice, typically lead to primary care careers and those that typically lead to nonprimary care careers.

[7]Teaching hospitals are hospitals with one or more graduate medical education programs approved by the Accreditation Council for Graduate Medical Education or the American Osteopathic Association.

[8]For example, residents in family practice are required to participate in internal medicine rotations. However, these residents may elect to participate in subspecialty rotations. In addition, family practice, as well as internal medicine and pediatrics, has specific requirements for continuity of care training. Continuity of care assignments afford residents the opportunity to provide first contact and ongoing care to a group of patients over time.

[9]Some studies include obstetrics/gynecology in their definition of primary care. Several studies have shown that other specialists provide some primary care to their patients. In addition, nurse practitioners, physician assistants, and others make significant contributions to the provision of primary care.

which entails consulting with other physicians and referring for necessary specialized services, is another important aspect of primary care.

Interest in Primary Care Declining

Interest in primary care careers among medical students has decreased during the past decade. The proportion of senior medical students planning careers in primary care specialties decreased from about 32 percent in 1984 to about 19 percent in 1993.[10]

Interest in primary care careers has also decreased among residents. Although about 40 percent of first-year residency positions are in internal medicine, pediatrics, and family practice programs,[11] many residents in such programs pursue additional training and enter practice as subspecialists rather than as primary care physicians. For example, although first-year residents in internal medicine constitute more than half of the pool of potential primary care physicians, it has been estimated that 55 to 68 percent of internal medicine residents elect to subspecialize. In the discipline of pediatrics, it has been estimated that between 18 and 40 percent will subspecialize.[12,13]

Various studies indicate that many factors can influence the career choices of medical students and residents. Medical school graduates, for example, report factors such as physician role models and clerkships as strong influences on their specialty decisions.[14] For residents, economic factors such as income potential and job opportunities in a specialty area and the residency training experience are among the factors influencing their decisions to further subspecialize.

[10]The proportion of senior medical students planning careers in primary care specialties reached a low for the 1984-93 period of 14.6 percent in 1992. Although it increased, the proportion of senior medical students with primary care career plans in 1993 remained below the 1984 level. This increase is thought to be associated with a growing emphasis on primary care by medical schools as well as special initiatives to foster generalist specialties.

[11]Based on first-year positions available for 1993.

[12]Family physicians who pursue additional training do not necessarily become subspecialists. For example, family physicians may pursue additional training for added qualifications in geriatrics, which is not a subspecialty but rather provides additional expertise in the discipline.

[13]These ranges are based on various subspecialization estimates cited in the literature.

[14]Among factors influencing specialty decisions, 1993 medical school graduates also reported perceived fit of personality, skills, and ability with the selected field as major influences. Prestige and authority factors, lifestyle variables, economic influences, and income prospects overall were given relatively low ratings. See D.G. Kassebaum, M.D., and P.L. Szenas, M.A., "Factors Influencing the Specialty Choices of 1993 Medical School Graduates," Academic Medicine, 69 (1994), pp. 164-70.

This report focuses on identifying personal and educational factors that influence student career decisions during the fourth year of medical school and describes characteristics of the educational process that may orient students and residents to pursue primary care careers. The report also explores the role of federal financing in orienting the focus of medical education.

Scope and Methodology

To identify the characteristics associated with students who are more likely to choose primary care or nonprimary care specialties, we combined information from 3 databases on nearly 9,000 medical school graduates in the class of 1989.[15] We then applied a statistical technique, logistic regression, to identify the significant characteristics of students more likely to choose primary care specialties. In logistic regression, we can assess the association of each characteristic, or factor, to the likelihood of choosing primary care specialties while controlling for the effects of the other characteristics in the model.

We also surveyed all 126 allopathic and 15 osteopathic medical schools in the United States.[16] About 89 percent of allopathic medical schools and 100 percent of osteopathic medical schools responded to our survey. The questionnaire sought to determine the extent to which schools required observation or training in primary care as part of their curricula.

To examine the extent to which residents are exposed to primary care medicine, we surveyed a sample of 534 residency program directors from allopathic and osteopathic programs in the disciplines of internal medicine, pediatrics, family practice, and osteopathic general practice. About 82 percent of program directors responded to our survey. In the allopathic disciplines, we distinguished between traditional track programs and primary care track programs. We defined primary care track programs as (1) programs listed in the National Resident Matching Program as having a primary care focus or (2) programs receiving funds from the Health Resources and Services Administration to support a primary care curricular focus within the program.

[15]We aggregated data from three national surveys conducted by the Association of American Medical Colleges (AAMC) to construct a database of information on medical students graduating in 1989. The three surveys are the (1) Premedical Student Questionnaire, (2) Matriculating Student Questionnaire, and (3) Graduation Questionnaire.

[16]Allopathic medicine is the most common form of medical practice. Graduates of allopathic medical schools receive M.D.s. Osteopathic medicine is a form of medical practice similar to allopathic medicine that also incorporates manual manipulation of the body as a therapy. Graduates of osteopathic medical schools receive D.O.s.

Finally, we drew from our previous work on the federal financing of graduate medical education;[17] reviewed numerous studies and official documents related to medical specialty choice and medical education funding; and interviewed officials of government agencies that fund medical education, medical school deans, hospital administrators, directors of residency programs, academic medical centers, and representatives of professional medical associations. (See apps. I and III for details of our scope and methodology.)

We conducted our work from May 1992 to September 1994 in accordance with generally accepted government auditing standards.

Likelihood of Choosing Primary Care Specialty Influenced by Various Factors

Our analyses showed that a set of factors related to medical education is associated with an increased likelihood of students choosing to pursue primary care careers. These factors include characteristics of the students that medical schools admit and training that students receive in medical school and later in residency programs. Our review of the literature found that research is generally consistent with our findings.[18]

Some Personal Characteristics Are Associated With Primary Care Choice

Using logistic regression, we examined the relationship of the characteristics of medical students and the schools they attend to the likelihood of students choosing a primary care career in the fourth year of medical school. In our analyses, the strongest predictor of choosing primary care was a student's intention to pursue a primary care specialty as stated at what is typically the first decision point—the last year of college before attending medical school. Students who stated such a preference were about twice as likely to pursue primary care as students who expressed a preference for a nonprimary care specialty and those who did not have a preference.

In addition, the following sociodemographic characteristics were associated with the greater likelihood of students choosing to pursue primary care careers:[19]

[17]Medicare: Graduate Medical Education Payment Policy Needs to Be Reexamined (GAO/HEHS-94-33, May 5, 1994).

[18]In our analyses we used two models. Model 1 included student data from all schools. Model 2 included student data from schools with departments of family practice. About four-fifths of the students in our original database are included in Model 2.

[19]Results are from Model 1 only.

- Married students were 40 percent more likely than unmarried students to pursue primary care.
- Female students were 54 percent more likely than males to pursue primary care.
- Mexican-American students were 66 percent more likely than white Americans to pursue primary care.
- Students who spent most of their high school years in rural areas (fewer than 10,000 inhabitants) were 60 percent more likely to pursue primary care than students from nonrural areas.[20]

Medical School Experiences Affect Students' Career Choice

We also analyzed characteristics of the schools that students attended. We were specifically interested in assessing the association of characteristics thought to support primary care experiences during medical school. These characteristics include the existence of a family practice department, a required family practice clerkship during the third year,[21] the funding level of family practice departments (defined as the ratio of family practice department funding to the number of enrolled students), and whether the school was public or nonpublic. The research intensity of the schools students attended was also included in the model to assess whether medical schools that receive large amounts of research funding orient students away from primary care medicine.

The following characteristics of the medical schools were associated with a greater likelihood of students choosing to pursue primary care careers:[22]

- Students who attended schools with family practice departments were 57 percent more likely to pursue primary care than those attending schools without family practice departments.
- Students who attended schools requiring a third-year family practice clerkship were 18 percent more likely to pursue primary care than students attending schools without this requirement.

[20]We did not include students' income prospects in our models because this variable, in other AAMC surveys, has consistently been reported to have limited influence on specialty choice. See "Factors Influencing the Specialty Choice of 1993 Medical School Graduates."

[21]We focused on family practice departments because this discipline does not generally include experiences in subspecialty training. Internal medicine and pediatric departments provide experiences in both the primary care and subspecialty areas in these disciplines.

[22]The first result in this list is from Model 1; the others are from Model 2.

- Students attending medical schools with more highly funded family practice departments were 18 percent more likely to pursue primary care than those attending schools with lower funding.[23]
- Students attending public medical schools were 38 percent more likely to pursue primary care careers than students attending nonpublic medical schools.

The hypothesis that students attending medical schools that receive large amounts of research funding are oriented away from primary care was not supported in our model. Career choices of students, for either primary care or nonprimary care, were not associated with the research intensity of the schools they attended. [24,25] Appendix I provides the details of our analyses.

Medical Education and Training Do Not Stress Primary Care Medicine

The results of our logistic regression models suggest that in addition to characteristics that predispose students towards primary care or nonprimary care medicine, characteristics of medical schools also exert an influence on the career choices of medical students. Studies of residency programs found in the literature also suggest that the training environment—clinical experiences and faculty role models—can influence residents' decisions to enter practice or to continue training and subspecialize. Through our survey of medical schools and residency programs, however, we found that many of the medical schools did not have required curricula that expose students to primary care experiences before the fourth year of medical school when students formally select the area of medicine to pursue.[26] Similarly, only a small portion of resident training time was spent in settings that give residents experience with continuous and comprehensive care or undifferentiated health problems. Finally, instructors and faculty, who could serve as students' and residents' role models, were infrequently primary care physicians. This

[23]More highly funded family medicine departments are those with the highest ratio of total departmental revenues to number of students. In 1989, the highest ratio was $6,570 or more (the highest third) compared with less than $3,157 (the lowest third).

[24]The research intensity of a school was expressed as a ratio of total federal research dollars to the number of students enrolled in the school.

[25]These associations were found to be statistically significant while controlling for the effects of the other variables in the model. For example, the finding that students who attended schools with family practice departments were 57 percent more likely to pursue primary care than students attending medical schools without a family practice department was significant, controlling for the research intensity of the school, the students' initial preferences to pursue primary care or specialty medicine, and the students' age or sex.

[26]Since 1992, the Liaison Committee on Medical Education's standards for accreditation of medical schools have required schools to offer a core curriculum in primary care.

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orientation toward specialty medicine within education and training may contribute to a smaller proportion of students and residents choosing primary care careers.

Medical Students Receive Limited Exposure to Primary Care Medicine

Medical students' early contact with primary care can occur during the first or second year of medical school through preceptorships in which students observe practicing physicians in the community. About 35 percent of schools responding to our survey (45 of 127 schools[27]) indicated that they required preceptorships for first- or second-year medical students. Of these schools, about 65 percent did not require primary care preceptorships.

Clerkships, which for the most part constitute the medical school curriculum for the third and fourth years, provide students with clinical training in which they learn by observing and actively participating in the care of patients. Third-year clerkships, in particular, are an important influence on student decisions regarding the types of residency training programs they will pursue. Our survey results indicate that of schools offering clerkships in internal medicine, pediatrics, and family practice, about 53 percent required clerkships in all three. Moreover, about one-third of schools with clerkship requirements for all three disciplines[28] required rotations with a primary care focus by the end of the third year. More specifically, about

- 60 percent of schools did not require a primary care rotation as part of required third-year clerkships in internal medicine,[29]
- 38 percent of schools did not require a primary care rotation as part of required third-year clerkships in pediatrics,[30]
- 42 percent of allopathic schools did not require a family practice clerkship, and
- 13 percent of osteopathic schools did not require a general practice clerkship.

[27]Overall, 127 of 141 allopathic and osteopathic medical schools responded to our survey.

[28]Based on allopathic schools only.

[29]All allopathic and osteopathic schools responding to our survey required an internal medicine clerkship for third-year students.

[30]About 98 percent of allopathic and osteopathic schools responding to our survey required a pediatrics clerkship for third-year students.

In addition, on average about 58 percent of total clinical faculty—individuals who could serve as role models—were in nonprimary care specialties and subspecialties. More specifically, about 68 percent of tenured faculty, about 62 percent of nontenured faculty, and about 55 percent of active volunteer faculty were in nonprimary care specialties and subspecialties.

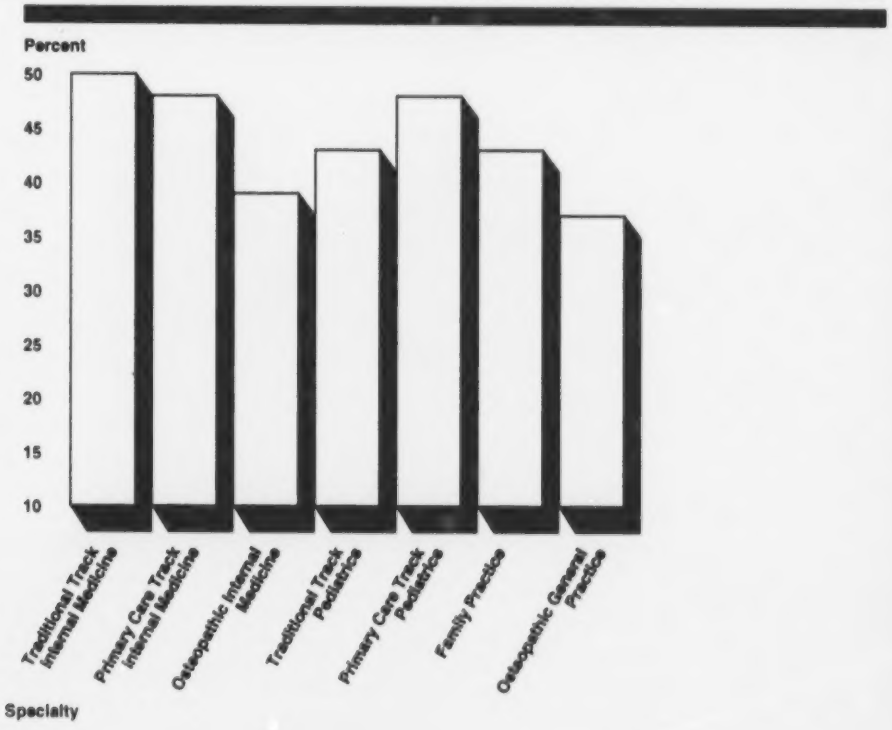
Residents Mostly Trained in Nonprimary Care Settings

Residency programs whose residents constitute the pool of potential primary care physicians—programs in internal medicine, pediatrics, family practice, osteopathic general practice—provided limited primary care training.[31] Our survey of such programs indicated that there was little exposure to primary care medicine in ambulatory settings. The survey also showed that even in family practice programs, training in ambulatory care settings was limited.

As part of residency training, residents must complete required rotations through which they are acquainted with various areas of medical knowledge. These rotations are typically comprised of 1-month "blocks." Our survey indicated that on average between one-third and one-half of required block time was typically spent in primary generalist rotations. (See fig. 1.)

[31]More specifically, the categories of programs surveyed were traditional track internal medicine, primary care track internal medicine, osteopathic internal medicine, traditional track pediatrics, primary care track pediatrics, family practice, and osteopathic general practice. The "averages" presented hereafter represent the average for each program category.

Figure 1: Proportion of Total Block Rotation Time Spent in Generalist Rotations

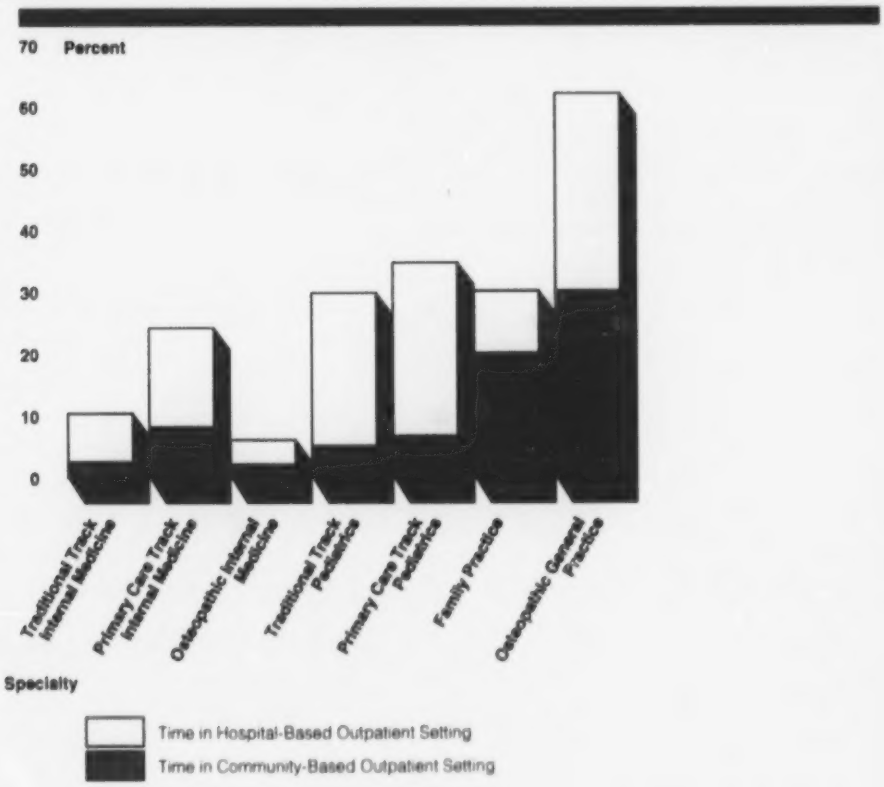


Note: Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 2 percentage points for family practice (generalist) to 6 percentage points for osteopathic general practice (generalist) programs.

Our survey data also indicated that even for generalist rotations, residents spent, on average, most of their time in hospital inpatient settings.[32] The proportion of time spent in hospital outpatient or ambulatory settings during generalist rotations ranged from an average of 8 percent for traditional track internal medicine programs to 27 percent for osteopathic general practice programs. Moreover, the proportion of time spent in community-based outpatient settings—which most closely resemble primary care practice settings—ranged from an average of 2 percent for traditional track internal medicine programs to 31 percent for osteopathic general practice programs. (See fig. 2.)

[32]The exception was osteopathic general practice programs in which residents spent, on average, about 38 percent of their time during generalist block rotations in hospital inpatient settings.

Figure 2: Average Proportion of Generalist Rotation Time Spent in Outpatient Settings



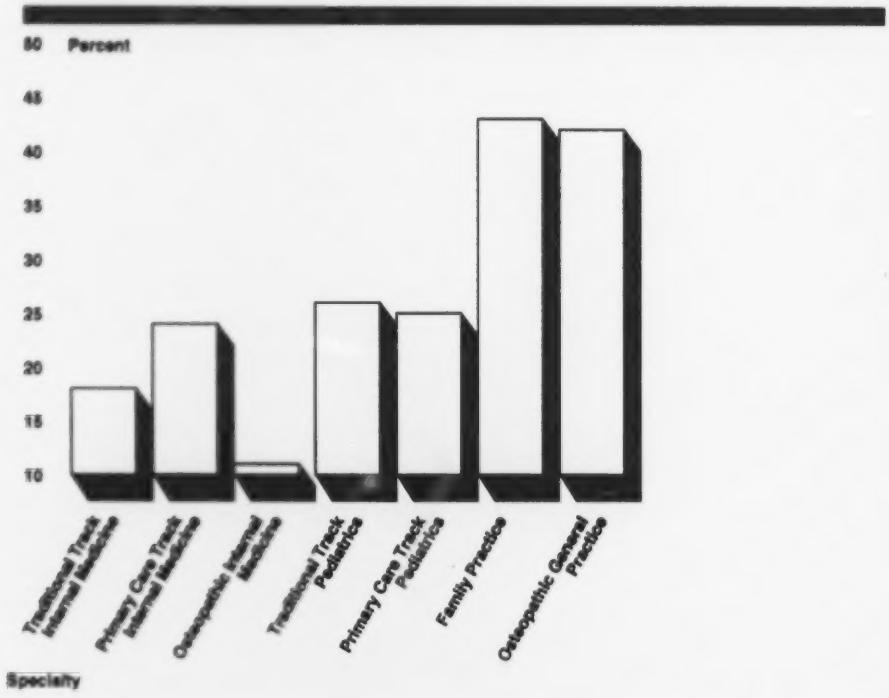
Note: Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 1 percentage point for traditional track internal medicine (community-based) to 11 percentage points for osteopathic general practice (community-based) programs.

A portion of residency training also consists of elective rotations, where residents can augment their training based on perceived needs or interests. Elective rotations constitute about one-third of total residency training time. Our survey indicated that specialty-oriented rotations in hospital settings were the most frequently chosen elective rotations—in most programs about one-half or more of residents elected such rotations.[33] In contrast, the average proportion of residents electing primary care rotations in community-based ambulatory settings tended to

[33]The exception was residents in osteopathic general practice programs. About 38 percent of osteopathic general practice residents elected specialty-oriented rotations in hospital settings.

be lower—the proportions varied across programs from 43 percent for family practice residents to 9 percent for osteopathic general internal medicine residents. (See fig. 3.)

Figure 3: Average Proportion of Residents Electing Rotations in Primary Care Community-Based Ambulatory Settings

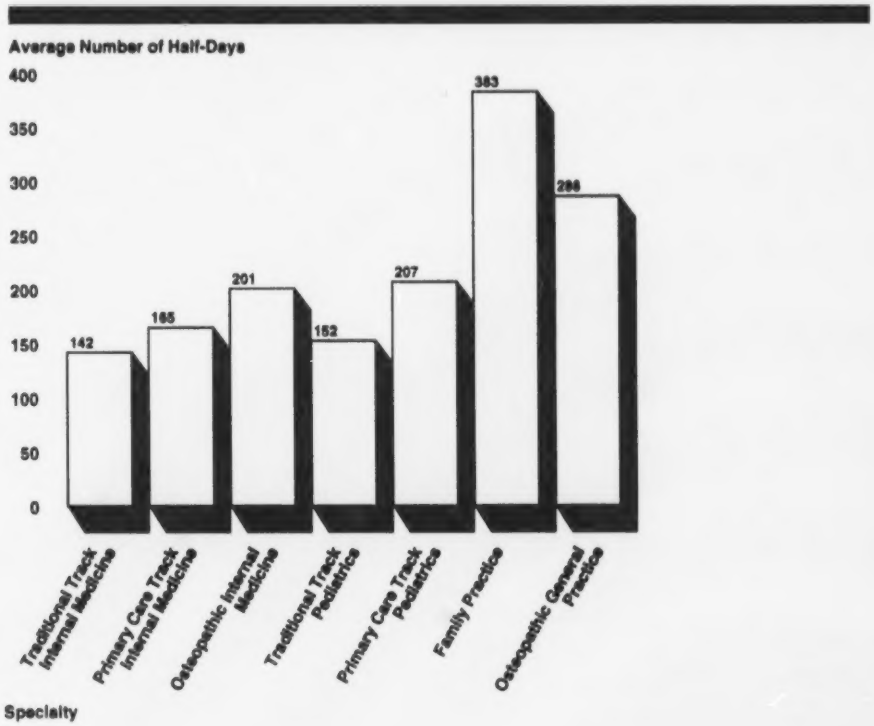


Note: Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 4 percentage points for traditional track pediatrics to 12 percentage points for osteopathic general practice programs.

A relatively small portion of residency training consists of continuity of care assignments. Ideally, in these assignments, residents are assigned specific patients who are seeking care for the first time for a new condition or routine care. Residents are expected to follow these patients over time, provide continuous care, and learn to recognize and manage illnesses. The amount of time spent in continuity of care assignments is usually accumulated in terms of half-days.

Our survey found that the amount of time that programs required residents to spend in continuity of care assignments varied across programs from an average of 383 half-days for family practice programs to an average of 142 half-days for traditional track general internal medicine programs. (See fig. 4.)

Figure 4: Average Number of Half-Days Spent in Continuity of Care Assignments



Notes: Data reflect half-days spent in continuity of care assignments during postgraduate training years one through three.

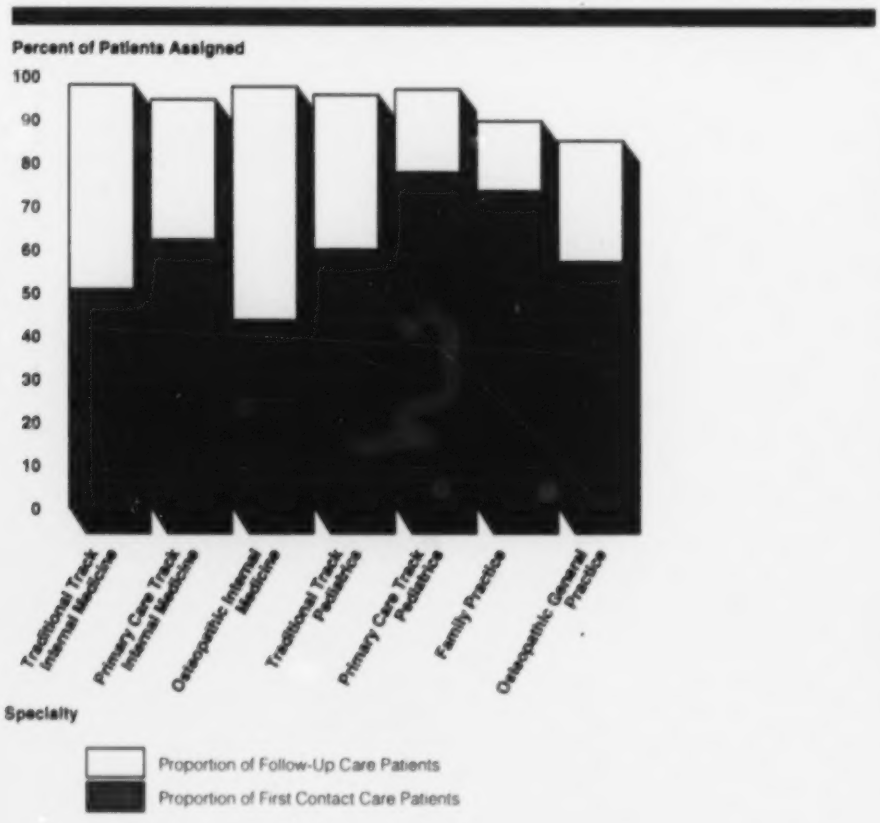
Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 12 half-days for traditional track pediatrics to 25 half-days for osteopathic general practice programs.

Continuity of care assignments should offer experiences that closely approximate what a generalist physician will do in primary care practice;

thus, such assignments are considered a fundamental training component for primary care physicians. Our survey indicated, however, that on average a majority of residents in almost all programs fulfilled their continuity of care assignments in hospital-based general medicine clinics.[34] Moreover, substantial proportions of patients in continuity of care assignments within most programs were not assigned to residents for first contact care for a new condition or routine care. In our survey, the proportion of patients assigned for follow-up care, rather than for first contact care, varied across programs from an average of 16 percent for family practice programs to an average of 54 percent for osteopathic general internal medicine programs. (See fig. 5.)

[34]The exceptions were osteopathic general internal medicine and general practice programs. For osteopathic general internal medicine programs, about 47 percent of residents on average fulfilled continuity of care assignments in other primary care settings. For general practice programs, about 45 percent of residents on average fulfilled their continuity of care assignments in other nonprimary care settings.

Figure 5: Average Proportion of Patients Assigned to Residents in Continuity Clinics for First Contact Care and for Follow-Up Care



Notes: Totals do not add to 100 percent because of an "other" category that is not shown here.

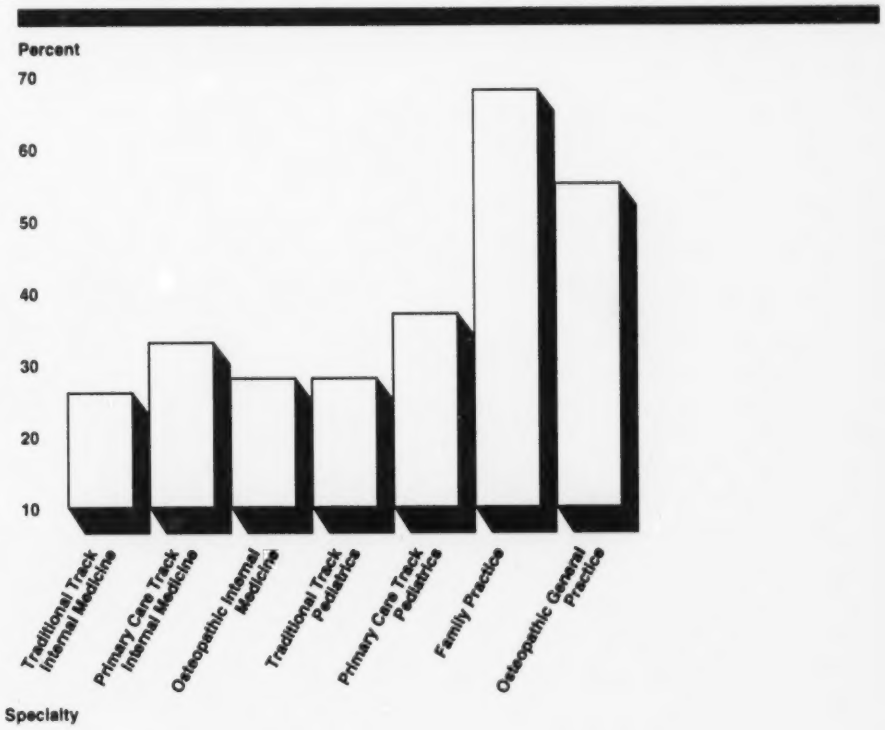
Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 4 percentage points for family practice (first contact) and traditional track internal medicine to 16 percentage points for osteopathic general practice (first contact) programs.

Residents Mainly Encounter Nonprimary Care Role Models

Residents in almost all programs were trained predominately by nonprimary care faculty.[35] For internal medicine and for pediatrics programs in our survey, an average of 40 percent or less of the faculty were generalist physicians. Thus, in these two disciplines, programs had few generalist role models training residents in primary care medicine. (See fig. 6.)

[35]The exceptions were osteopathic general practice and allopathic family practice programs. For general practice programs, on average about 55 percent of faculty were generalists; for family practice programs, on average about 68 percent of faculty were generalists.

Figure 6: Average Proportion of Total Faculty Who Were Generalist Physicians



Note: Except for osteopathic internal medicine and primary care pediatrics, for which all programs were sampled, sampling errors at the 95-percent confidence level for estimates in the figure ranged from 3 percentage points for traditional track internal medicine and pediatrics to 7 percentage points for family practice and osteopathic general practice programs.

Internal Medicine Programs That Emphasized Primary Care Produced More Graduates Who Entered Primary Care Practice

While residents in internal medicine programs constitute the largest portion of primary care residents, it has been estimated that more than half of such residents pursue additional training and enter practice as subspecialists. Our survey data suggest that internal medicine residency programs provided limited exposure to primary care faculty and primary care medicine in ambulatory settings. To further explore the relationship between program opportunities to acquaint residents with primary care faculty and medicine and the proportion of residents choosing to enter generalist practice, we conducted a separate analysis of both categories of internal medicine programs.[36]

[36]In this analysis, primary care and traditional track programs were combined.

Our analysis showed a significant association between program opportunities to expose residents to primary care faculty and the proportion of residents choosing generalist practice.[37] On average, a greater proportion of residents entering generalist practice was found to be associated with internal medicine programs with a higher than average proportion of

- full-time primary care faculty,
- hospital rounds taught by primary care faculty, and
- required inpatient block rotations taught by primary care faculty.

Our analysis also showed a significant association between certain characteristics of a program's continuity of care assignments and a program's output of generalist physicians. A greater proportion of residents entering generalist practice was associated with programs that provided for

- continuity of care clinic experiences in which more than 80 percent of training time was spent in a primary care setting and
- exposure to a higher than average percentage of continuity of care clinic patients seeking care for the first time for a new condition.

These results suggest that training programs and their curricula may influence residents' decisions to practice general medicine or specialize.

Limited Reimbursement for Nonhospital-Based Training Cited as a Barrier

The lack of reimbursement for training residents in settings other than hospitals was reported to be a major barrier to the establishment or maintenance of community-based ambulatory training. With regard to barriers to training residents outside the hospital setting, the following three were most commonly cited by most residency programs:[38]

- insufficient government reimbursement for training residents in community-based ambulatory settings,

[37]Program characteristics reported to be statistically significant reflect achieving a chi square test result with a p-value at the 95-percent confidence level or greater ($p<.05$); that is, if there was no difference in the universe, it is unlikely (less than a 5-percent chance) our sample results would show a difference of this magnitude.

[38]The exception was primary care internal medicine programs. The three most commonly cited barriers for those programs were insufficient government reimbursement for training residents in community-based ambulatory settings, insufficient private payer reimbursement for training in community-based ambulatory settings, and hospital service or staffing needs (instead of insufficient government reimbursement for services provided in community-based ambulatory settings).

- insufficient private payer reimbursement for training in community-based ambulatory settings, and
- insufficient government reimbursement for services provided in community-based ambulatory settings.

Hospitals Play Dominant Role in Medical School and Residency Training

Residency programs are primarily sponsored by and based in teaching hospitals. Medical schools rely on teaching hospitals for the clinical training aspects of the medical school curriculum. Through such affiliations, teaching physicians in the hospital supervise residents and, assisted by residents, instruct third- and fourth-year medical students. Our surveys indicated that through such teaching arrangements, the clinical training of residents and, in turn, of medical students consisted mainly of experiences with specialist role models and hospital patients. For the most part, hospital patients do not require those diagnostic or clinical practice skills characteristic of primary care medicine: evaluation of undifferentiated health problems and comprehensive and routine care. As a result, many residents and medical students have little opportunity to have experiences that most resemble primary care practice.

Financing Mechanisms Contribute to Focus on Specialty Medicine

The way residency training is financed contributes to a specialist orientation within medical education and training. In general, there are financial disincentives for teaching hospitals to sponsor primary care training; current financing mechanisms for residency training are more supportive of training in specialist-oriented settings than in generalist-oriented settings. Because the clinical experiences of medical students are linked to the training of residents, residency program financing can shape the types of role models and training experiences medical students have.[39]

The chief means of support for residency programs are teaching hospital revenues from patient care.[40] Hospital-based services usually generate more revenue for medical service plans and the hospital itself. Primary care, for the most part, is an ambulatory practice; that is, it is largely

[39]See app. II for information on certain federal programs that support residency training and medical school education.

[40]Patient-care revenues are also a revenue source for medical schools. Under a financing arrangement known as medical service plans, a portion of the revenue generated by clinical faculty patient services helps fund medical school departments. During the 1990-91 period, medical service plan revenues comprised about 31 percent of total revenues for U.S. medical schools. According to Eli Ginzberg and others, these funds are used to cover the salaries of most of the expanded clinical staff and also help pay for some departmental and general medical school operations (The Economics of Medical Education, Josiah Macy Foundation (New York, 1993), p. 34).

conducted in nonhospital settings, such as doctors' offices and clinics. Because inpatient care services and specialty education generate more revenues, there is a disincentive for educators to increase the time that residents spend in outpatient or ambulatory care settings.[41] With such differences in revenues, sponsoring primary care training programs may be financially disadvantageous to teaching hospitals.

Medicare, unlike private third party payers, makes separate payments to hospitals for its portion of the "direct" and "indirect" costs of graduate medical education.[42,43] Historically, the Congress viewed Medicare support for residency training programs as necessary to help meet community needs for trained health personnel.[44] Absent federal guidance on the number and types of residents to be trained, in effect Medicare relies primarily on hospitals to determine the specialty distribution of physicians to be trained. During the 1989-91 period, hospitals used Medicare direct medical education funds to support the training of 75 percent specialists and 25 percent generalists.

In addition, Medicare's payment methodology also creates barriers to primary care training by limiting payment for training in nonhospital-based settings. Under current Health Care Financing Administration (HCFA) rules, only hospitals and hospital-based providers are eligible to receive Medicare payments for training costs in nonprovider settings. That is, when residents do train in outpatient or ambulatory settings, Medicare only reimburses the direct costs of such training when the ambulatory care provider has a teaching agreement with a hospital. This is because Medicare limits such reimbursement for training in ambulatory settings to those programs for which hospitals incur almost all or substantially all of the training costs.

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[41]See Primary Care Physicians: Financing Their GME in Ambulatory Settings, Institute of Medicine (1989).

[42]Hospital charges are generally set at levels high enough to cover a portion of the facility's training costs; private payers contribute toward such costs in this way. However, in the current marketplace, many large-scale purchasers make no distinction between the price they are willing to pay to a teaching hospital versus a nonteaching hospital, despite teaching hospitals' higher costs. Furthermore, many purchasers try to encourage their beneficiaries to use less costly providers.

[43]Direct costs include teachers' and residents' salaries as well as facility and equipment expenses. Indirect costs include those higher patient care costs thought to be due to such factors as increased diagnostic testing, increased number of procedures performed, and higher staffing ratios. In 1992, Medicare provided about $1.46 billion for direct costs of resident training and $3.56 billion for indirect costs. See GAO/HEHS-94-33.

[44]Committee reports indicated that these educational activities enhance the quality of care in an institution and that Medicare should recognize these costs for reimbursement purposes until communities undertake to bear such costs in another manner.

Conclusions

Our analyses of student characteristics associated with choosing primary care and the results of our surveys of medical schools and residency programs suggest that training institutions may be able to do more to increase the number of practicing primary care physicians.

Medical schools, for example, could evaluate their recruitment and admissions policies to assess how much importance is placed on recruiting and admitting students who are interested even before entering medical school in pursuing primary care specialties. Our model results indicate that such students were twice as likely to pursue training in primary care. Medical schools could also assess their success in recruiting and admitting students from diverse sociodemographic backgrounds. Our model results suggest that schools with diverse student bodies are more likely to have a larger pool of students interested in pursuing primary care careers.

The results of our survey also indicate that primary care training did not have a prominent place in most medical schools. Schools could help cultivate or maintain an interest in primary care by providing students with greater exposure to primary care curricula and role models before the fourth year when medical career decisions are made. Our survey results of residency programs that train the pool of potential primary care physicians indicate that these programs provided relatively few role models and clinical experiences that closely resemble primary care practice. This situation was due, in part, to current financing mechanisms that provide more support for residency training in hospital settings and for specialty-oriented clinical faculty than for primary care training and faculty. In particular, Medicare's payment methodology for the direct costs of residency training tends to reinforce a specialty orientation within physician training. Because medical care continues to move outside the boundaries of the hospital, we believe that in addition to supporting hospital-based training, the federal government may want to encourage greater training in nonhospital settings.

Matter for Congressional Consideration

To support the training of primary care physicians, the Congress may want to consider modifying Medicare's payment methodology for the direct costs of graduate medical education to provide incentives for training in nonhospital settings.

Officials at the Bureau of Health Professions, Health Resources and Services Administration reviewed a draft of this report. They generally

agreed with the information presented. We have incorporated their comments where appropriate.

Previously, HHS officials commented on a draft of our report, GAO/HEHS-94-33, on Medicare's payment methodology for the direct costs of graduate medical education. In those remarks, HHS officials stated that the Council on Graduate Medical Education (COGME), which is adminstered by the Public Health Service and reports to the Secretary and the Congress on matters related to graduate medical education, has stated many of the same concerns regarding barriers to primary care training contained in that report. HHS officials further stated that COGME is concerned that this payment methodology provides an incentive to add residency positions based on hospital service needs rather than societal and educational needs. This incentive is inconsistent with the view that there should be more educational experiences at nonhospital, community-based sites.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies to others on request. If you have any questions about this report, please call me at (202) 512-7119. GAO contacts and staff acknowledgments are listed in appendix IV.

Sarah F. Jaggar
Director, Health Financing
and Policy Issues

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Abbreviations

AAMC	Association of American Medical Colleges
COGME	Council on Graduate Medical Education
HCFA	Health Care Financing Administration
HHS	Department of Health and Human Services
HMO	health maintenance organization
MCAT	Medical College Admission Test
SAIMS	Student and Applicant Information Management System

Personal and Institutional Characteristics Associated With Choice of Primary Care Residency Program

Using statistical models, we performed two analyses to identify selected characteristics associated with the likelihood that a graduating medical student would seek certification in a primary care specialty. On the basis of literature reviewed and interviews with medical education experts, we identified the major factors claimed to influence student specialty choice and incorporated into our analyses those factors for which there were data. Specifically, we sought to (1) identify the characteristics of students who were more likely to choose generalist or primary care specialties, (2) estimate the effect of a medical school's emphasis on primary care training, and (3) estimate the effect of a medical school's research funding.

In our analyses, we looked at the relationship of student and school characteristics to the likelihood of choosing generalist residencies. We used a statistical technique, logistic regression, to assess these relationships. Our analyses included 8,939 students graduating in 1989 from allopathic medical schools in the United States; these data were obtained from the Association of American Medical Colleges (AAMC). Characteristics assessed for their relationship to student specialty choice are identified in tables I.1 and I.2.

Results of Our Analyses

Particular demographic characteristics were associated with the likelihood that medical students would choose generalist (or primary care) specialties when they graduated. Our logistic models showed that students who were female, married, Mexican-American, or from a rural area were more likely to indicate an interest in pursuing primary care specialties than students who were male, single, white, or from a nonrural area. In measuring the consistency of students' specialty choices before they entered medical school and upon their graduation, we found that a student's indication of early interest in primary care was a strong predictor of the generalist residency choice.

Our analyses also showed a statistically significant association between the medical school's commitment to primary care education and the likelihood that a graduating student would choose a generalist specialty. In our analyses, students attending schools that were public, had a highly funded family practice department,[45] or required a family practice clerkship in the third year were more likely to pursue a generalist specialty. Our analyses did not show, when controlling for other factors, a statistically significant association between the amount of research

[45]Highly funded family practice departments are those with the highest ratio of total departmental revenues to number of student enrollees. In 1989, the highest ratio was $6,570 or more (the highest third) compared with less than $3,157 (the lowest third).

funding a school received and student specialty choice. This finding does not support other studies that suggest that the research intensity of a school encourages students to develop an interest in specialty medicine and ultimately to choose a subspecialty.[46]

Some Demographic Groups More Likely to Select Primary Care

Our analyses showed that several demographic variables were statistically significant predictors of specialty preference. Mexican-American students, students from rural areas, female students, and married students were more likely than their counterparts to indicate a preference for primary care. These differences in likelihood ranged from 66 percent for Mexican-American students (compared with white students) to 40 percent for married students (compared with unmarried students). While some studies have shown age to be significantly related to specialty selection, our analysis, which controlled for several demographic variables, showed no significant difference between older (age 30 and over) and younger (less than age 30) graduates in their likelihood of selecting primary care.

Students With Most and Least Educational Debts Less Likely to Select Primary Care

Amount of medical education debt was also a statistically significant predictor of student specialty choice. Students with education debts in the middle quartiles of more than $10,000 to $50,000 were about 23 to 26 percent more likely to select primary care than students with debt exceeding $50,000. It has been hypothesized that the higher the level of debt, the more inclined a student would be to pursue a specialty with a high earning potential.

Premedical School Preference Is Strong Predictor in Models

Some students graduating from medical school may have been predisposed, even before they entered medical school, to a primary care career. In our models, students' intentions for medical careers, as stated typically in their last year of undergraduate college before attending medical school, were the strongest predictor of student specialty choice. Our models estimate that students who indicated a primary care preference in college were about twice as likely to indicate a preference for primary care in their final year of medical school as students who indicated a preference for a nonprimary care specialty or indicated no preference in their senior year of undergraduate college.

[46]In our analyses, the level of a school's research funding was a proxy for its research intensity.

Variables Reflecting Medical School Environment

We also used the models to assess the relationship between selected medical school characteristics and students' likelihood of selecting primary care. The estimates from our models reflect the net effects of the medical school characteristics, controlling for the influence of students' preferences before entering medical school and their demographic characteristics.

Existence of Family Practice Department Is Significant Predictor

Because we considered the existence of a family practice department to be an indicator of a school's emphasis on or commitment to primary care, we incorporated a variable in one model that compared choices of students who attended schools with family practice departments with choices of those students who attended schools without such a department. The results indicated that students who attended medical schools with family practice departments were 57 percent more likely to select primary care than students from schools without these departments.

Other School Factors Show Associations

For students who attended schools with family practice departments, we also examined whether the level of departmental funding, the requirement of a third-year family practice clerkship, and type of school ownership were related to the likelihood of choosing primary care. We found that funding and clerkship requirements were related to the choice of a primary care career; the likelihood of selecting primary care was slightly higher (by about 18 percent) for students attending schools with the most highly funded departments than for those students at schools with the least funded departments.[47] We estimated that the requirement of a third-year clerkship also had about an 18-percent effect. School ownership, however, also had a moderate effect; students attending schools that were publicly owned were 38 percent more likely to select a primary care specialty than their counterparts at nonpublic schools. One explanation is that since public medical schools depend more on public funds than nonpublic medical schools do, public schools may be more pressured to graduate more primary care physicians.[48]

Research Intensity Not a Significant Predictor

Some studies show an inverse relationship between the amount of research funding a medical school receives and the proportion of primary

[47]Highest level of funding was categorized at $6,570 or more per student; whereas, the lowest level of funding was $3,157 or less per student.

[48]See D. Campos-Outcalt and J.H. Senf, "Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty," Academic Medicine, 64 (1989), pp. 610-15.

care graduates selecting primary care, these studies did not control for the effects of other variables on specialty selection. Specifically, the studies showed bivariately that the more research funding a medical school receives, the smaller the proportion of primary care generalists it graduates. Our bivariate data also showed that schools with the highest level of federal research funding per student (top quartile) had a slightly smaller proportion of students who selected primary care (15 percent compared with 18 to 20 percent of students in the other quartiles).[49] Our models, which control for the effects of other variables, did not show a statistically significant association between research funding and the likelihood of a student selecting primary care.

Methodology

To identify characteristics that could be associated with the likelihood of students selecting a career in primary care medicine, we constructed a database from information on students who graduated in 1989 from 125 allopathic medical schools in the United States and in Puerto Rico.[50,51] The AAMC Graduation Questionnaire was the source for our outcome variable of interest, which captures the students' specialty intentions in their senior year of medical school before they enter the National Resident Matching Program.[52] Of the 15,573 students who graduated in that year, we excluded 4,445 students who did not respond to the AAMC questionnaire. Of the remaining 11,128 respondents, our models excluded an additional 2,189 individuals for whom we did not have complete data. Thus, our final models were based on 8,939 (57 percent) of the graduates. Because our models excluded a substantial number of 1989 graduates, we used available information to make comparisons between the cases who were included and those who were excluded (see data limitations section below). These analyses did not show any substantial differences between the groups.

Data Sources

To develop our analytic database, we combined information on medical school graduates with information about the institutions they attended.

[49]In our analyses, federal research dollars was a proxy for a school's research intensity or "milieu."

[50]The University of Minnesota at Duluth, School of Medicine, was excluded from our analysis because its students actually graduate from the University of Minnesota at Minneapolis.

[51]Because similar databases were unavailable for the osteopathic medical schools, we were unable to include osteopathic students or schools in our analyses.

[52]A.M. Singer, "The Class of 83: A Follow-up Study of 1983 Medical School Graduates Through the First Six Postgraduate Years," Contract # 240-87-00067 (Washington, D.C.: Health Resources and Services Administration, 1990). This report showed that student specialty indications in the Graduation Questionnaire were a good measure of the medical careers students ultimately entered.

Data on individual graduates were obtained from the AAMC's Student and Applicant Information Management System (SAIMS).[53] From SAIMS, we obtained demographic and financial information on students as well as information about their career intentions both before entering medical school and in their senior year. We compiled institutional data from several sources. We used 1987-88 AAMC-published directories to determine whether schools had family practice departments and whether they required third-year family practice clerkships. Data on funding and ownership were obtained from AAMC's Institutional Profile System.

Multivariate Analysis

We used two multivariate logit models to quantify the statistical impact of selected factors on the likelihood that a student intended to seek certification in a primary care specialty. These models were used to produce estimates of the effect of each factor, while holding constant the other factors that could influence the decision. The dependent variable of these models was the preferences of students for residency programs, as stated in January of their senior year. The variable was coded as 1 if they indicated that they planned to seek certification in family practice, general internal medicine, or general pediatrics; otherwise the variable was coded as 0. The independent variables included in the models reflected both individual characteristics of the graduates as well as characteristics of the institutions they attended. Table I.1 shows the number of students and percentage selecting primary care for each category of the individual student variables. Table I.2 shows the number of students and percentage selecting primary care for each category of institutional variables. These variables are described below as they were defined in the models.

Individual Student Variables

- Initial preference—Students indicating a preference for family practice, general internal medicine, or general pediatrics before entering medical school were classified as having an initial preference for primary care; all other student preferences were classified as other/unknown (data were obtained from the AAMC Premedical Student Questionnaire). This variable was used to control for student inclinations prior to entering the medical school environment.
- Student's hometown size—Students who spent the major portion of their high school years in nonsuburban towns of less than 10,000 persons were classified as being from rural areas.
- Marital status—Students who indicated on the Graduation Questionnaire that they were married or separated were classified as married.

[53]Data obtained from SAIMS came from the following surveys: (1) Premedical Student Questionnaire, (2) Matriculating Student Questionnaire, and (3) Graduation Questionnaire.

- Age—We classified students into two groups according to age at graduation: under 30 years old and 30 and older.[54]
- Race—Students were classified into the following categories according to how they described themselves in the Graduation Questionnaire: (1) black, not of Hispanic origin, (2) Asian or Pacific Islander, (3) Mexican-American, including other Hispanic or Chicano, (4) white, not of Hispanic origin, and (5) other.
- Sex—Students' gender was obtained from the Graduation Questionnaire.
- Debt—We used education indebtedness (premedical education plus medical school debts) as reported in the Graduation Questionnaire as an indicator of financial status of students at graduation. We classified students into the following categories of debt: (1) less than $10,000, (2) $10,000 to $29,999, (3) $30,000 to $49,999, and (4) $50,000 or more.

Institutional Variables

- Family practice department—We categorized schools as having a department (100 schools) or not (25 schools) based on the 1987-88 AAMC Directory of American Medical Education. Students were assigned to a category on the basis of the school they attended.
- Research funding—We categorized the schools into the following groups on the basis of the ratio of total federal research support dollars to number of students enrolled in 1988-89: (1) $13,560 or less (31 schools), (2) $13,561 to $25,414 (31 schools), (3) $25,415 to $71,800 (31 schools), and (4) $71,801 or more (32 schools). Students were assigned to a category on the basis of the school they attended.
- Family practice department funding—We categorized the schools with family practice departments into the following three groups on the basis of the ratio of total departmental revenues to number of students enrolled in 1989: (1) less than $3,157 (32 schools), (2) $3,157 to $6,569 (33 schools), and (3) $6,570 or more (33 schools). Students were assigned to a category on the basis of the school they attended.[55]
- Required third-year family practice clerkship—We categorized the schools with family practice departments according to whether their students were required to take a family practice clerkship in their third year (35 schools) or not (65 schools). This classification was based on the 1987-88 AAMC Curriculum Directory. Students were assigned to a category on the basis of the school they attended.

[54]See S.S. Allen and others, "Effect of Early Exposure to Family Medicine on Students' Attitudes Toward the Specialty," Journal of Medical Education, 62 (Nov. 1987), pp. 911-17. The results of this study indicated that students aged 31 and older, at entry into medical school, were more likely to choose family medicine.

[55]Data on departmental revenues were not available for two schools.

- Ownership—We categorized the schools with family practice departments according to whether they were a public institution (71 schools) or a private institution (29 schools). This classification was based on information about school ownership obtained from the AAMC Institutional Profile System. Students were assigned to a category on the basis of the school they attended.

Modeling Approach

We used a two-stage modeling approach to assess the effect of the institutional variables systematically. The first model, which captured data on students from all institutions, was used to test whether the existence of a department of family practice had an effect, controlling for the other variables in the model. The second model, which captured data on students who graduated from schools with a department of family practice, was used to examine the effects of departmental funding, a third-year clerkship requirement, and school ownership.[56] Both models included the individual student variables as well as the institutional research funding variable.

Presentation of Results as Odds Ratios

The logistic regression results for both models are presented in tables I.3 and I.4 as adjusted odds ratios. The odds ratio is a measure of association that compares the likelihood of an event occurring (for example, selection of primary care) in one group with a defined reference group. The reported odds ratio indicates the effect of a particular factor (for example, initial preference), controlling for the effects of the other variables in the model. The estimate of the effect, reflected in the odds ratio, is a net effect for a particular variable. The greater the odds ratio differs from 1, in either direction, the larger the effect it represents.

[56]These variables were not included in Model 1 because they only apply to schools with departments of family practice. That is, there was no departmental funding if a department did not exist, none of the schools without a department had a third-year clerkship requirement, and nearly all of the schools without a department were private. About one-fifth of the graduates were excluded from Model 2 because they attended schools without family practice departments.

Data and Model Limitations

Comparison of Respondents to Nonrespondents

Our intent was to base the analyses on all 1989 graduates of U.S. allopathic medical schools. For many graduates, however, data were not available for the dependent variable in our models. In particular, 29 percent of the graduating class (4,445 individuals) did not respond to the AAMC Graduation Questionnaire, the source of information for our dependent variable. When we compared the nonrespondents with the respondents on selected independent variables in our models, however, we found their distributions to be similar (tables I.5 and I.6.) The similarities suggested that the nonrespondents were not dramatically different from the respondents.[57]

Effect of Missing Data for Independent Variables

Our multivariate analyses also excluded cases with missing data on one or more independent variables. Of the 11,091 graduates with information on the dependent variable, we did not have complete information on the independent variables for 19 percent of the cases. Missing data on one variable only, size of student's hometown, accounted for a large proportion of these cases (14 of the 19 percent). Thus, if we had not included size of student's hometown as a variable in the models, we would have lost only 5 percent of the cases.

Because we were concerned about the potential impact of excluding 19 percent of the cases with information on our dependent variable, we compared our results with those we would have obtained without the hometown variable in the models. The effects of the independent variables were similar for both models and suggested that our results were not dramatically biased because of the exclusion of individuals without information on hometown size.

Other Variables

Another limitation of our models was the lack of information on certain variables that may be significant factors affecting career intentions of medical school graduates. For example, we were not able to directly control for such factors as the importance that students place on the prestige, intellectual stimulation, and earnings potential of various

[57]In addition to excluding the 4,445 nonrespondents, an additional 37 respondents to the AAMC Graduation Questionnaire were excluded because they did not respond to the question on specialty intentions.

specialty choices. However, our initial preference variable—specifying student intentions before attending medical school—may indirectly reflect some of these factors.

Table I.1: Individual Variables Included in the Models by Number of Students and Percentage Selecting Primary Care

Total students in group: 11,091

Variable	Students		Percentage selecting primary care
	Number	Percentage in group	
Initial preference			
Primary care	2,852	26	27.1
Other/unknown	8,239	74	14.4
Marital status			
Married	3,908	36	22.0
Not married	7,056	64	15.4
Education debts			
Less than $10,000	2,932	28	15.8
$10,000-29,999	2,153	20	19.3
$30,00-49,999	2,508	24	20.6
$50,000 or more	3,036	29	16.2
Age			
30 or older	2,167	20	19.7
Under 30	8,917	80	17.2
Sex			
Female	3,737	34	21.9
Male	7,354	66	15.5
Race/ethnicity			
White	9,086	82	18.0
Black	526	5	16.3
Asian	856	8	13.3
Mexican-American	152	1	26.3
Other	459	4	18.1
Hometown			
Rural	1,652	18	26.6
Nonrural	7,675	82	16.4

Table I.2: Institutional Variables Included in the Models by Number of Students and Percentage Selecting Primary Care

Total students in group: 11,091

Variable	Number of schools	Students		Percentage selecting primary care
		Number	Percentage in group	
Family practice department				
Yes	100	8,753	79	19.2
No	25	2,338	21	11.8
Research dollars per student				
Quartile 1 (less than $13,560)	31	2,161	20	18.5
Quartile 2 ($13,561-$25,414)	31	3,171	29	20.0
Quartile 3 ($25,415-$71,801)	31	2,816	25	17.8
Quartile 4 (above $71,801)	32	2,943	27	14.5
Departmental funding[a]				
Highest third (above $6,569)	33	2,521	29	21.8
Lowest third (less than $3,157)	32	3,244	37	17.0
Middle third ($3,157-$6,569)	33	2,886	33	19.2
Required third-year clerkship[a]				
Yes	35	2,559	29	21.4
No	65	6,194	71	18.4
Ownership[a]				
Public	71	6,207	71	20.8
Nonpublic	29	2,546	29	15.3

[a]Includes only students who attended schools with departments of family practice.

Table I.3: Model Results—Adjusted Odds Ratios and Confidence Interval for Individual Variables

Variable	Model 1 Adjusted odds ratio	Model 1 95% confidence interval	Model 2[a] Adjusted odds ratio	Model 2[a] 95% confidence interval
Initial preference				
Primary care	2.04[b]	1.83-2.29	1.95[b]	1.72-2.20
Other/unknown	1.00[c]		1.00[c]	
Marital status				
Married	1.40[b]	1.25-1.57	1.36[b]	1.20-1.54
Not married	1.00[c]		1.00[c]	
Education debts				
Less than $10,000	1.02	0.88-1.20	0.98	0.82-1.17
$10,000-29,999	1.23[b]	1.05-1.44	1.11	0.93-1.33
$30,000-49,999	1.26[b]	1.08-1.47	1.17	0.98-1.39
$50,000 or more	1.00[c]		1.00[c]	
Age				
30 or older	1.03	0.90-1.19	0.98	0.84-1.14
Under 30	1.00[c]		1.00[c]	
Sex				
Female	1.54[b]	1.37-1.72	1.48[b]	1.31-1.68
Male	1.00[c]		1.00[c]	
Race				
Black	0.89	0.68-1.17	0.81	0.60-1.10
Asian	0.75[b]	0.59-0.95	0.87	0.67-1.13
Mexican-American	1.66[b]	1.12-2.46	1.58[b]	1.03-2.43
Other	1.06	0.80-1.40	1.18	0.87-1.60
White	1.00[c]		1.00[c]	
Hometown				
Rural	1.60[b]	1.41-1.83	1.63[b]	1.42-1.88
Nonrural	1.00[c]		1.00[c]	

[a]Based only on students who attended schools with departments of family practice.

[b]Significantly different from 1.00 (reference category) at the 95-percent confidence level.

[c]Reference category.

Table I.4: Model Results—Adjusted Odds Ratios and Confidence Interval for Institutional Variables

	Model 1		Model 2[a]	
Variable	**Adjusted odds ratio**	**95% confidence interval**	**Adjusted odds ratio**	**95% confidence interval**
Family practice department				
Yes	1.57[b]	1.32-1.86		
No	1.00[c]			
Research dollars per student				
Quartile 1 (less than $13,560)	1.09	0.91-1.31	1.08	0.88-1.34
Quartile 2 ($13,561-$25,414)	1.15	0.98-1.34	1.12	0.91-1.38
Quartile 3 ($25,415-$71,801)	1.01	0.85-1.19	1.02	0.83-1.24
Quartile 4 (above $71,801)	1.00[c]		1.00[c]	
Departmental funding[a]				
Highest third (above $6,569)			1.18[b]	1.00-1.40
Middle third ($3,158-$6,569)			1.09	0.93-1.28
Lowest third (less than $3,157)			1.00[c]	
Required third-year clerkship[a]				
Yes			1.18[b]	1.02-1.35
No			1.00[c]	
Ownership[a]				
Public			1.38[b]	1.18-1.61
Nonpublic			1.00[c]	

[a]Based only on students who attended schools with departments of family practice.

[b]Significantly different from 1.00 (reference category) at the 95-percent confidence level.

[c]Reference category.

Table I.5: Comparison of Graduation Questionnaire Respondents to Nonrespondents for Selected Individual Variables

Percentage		
Variable	**Respondents (11,128)**	**Nonrespondents (4,445)**
Sex		
Female	34	33
Male	66	67
Race/ethnicity		
White	82	78
Black	5	6
Asian	8	8
Mexican-American	1	2
Other	4	5

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Table I.6: Comparison of Graduation Questionnaire Respondents to Nonrespondents for Selected Institutional Variables

Percentage		
Variable	**Respondents (11,128)**	**Nonrespondents (4,445)**
Department/clerkship		
No department or clerkship	21	22
Department but no clerkship	56	50
Department and clerkship	23	28
Departmental funding[a]		
Highest third (above $6,570)	29	24
Middle third ($3,157-$6,569)	33	39
Lowest third (less than $3,157)	37	36
Research funding		
Quartile 1 (less than $13,560)	20	21
Quartile 2 ($13,561-$25,414)	29	28
Quartile 3 ($25,415-$71,801)	25	29
Quartile 4 (above $71,801)	27	23
Public institution		
Public	58	62
Nonpublic	42	38

[a]Based on students who attended schools with departments of family practice. About 1 percent of both respondents and nonrespondents attended schools for which we lack information on funding.

Public Health Service Funding of Medical Education

In addition to funding medical education and training through the Medicare program, the federal government also provides funds through programs authorized under the Public Health Service Act.[58] Under title VII of the act, the Department of Health and Human Services provides two types of assistance for medical education and training:[59] (1) institutional support to medical schools through grants and contracts for special training programs and (2) student assistance through loans, loan guarantees, and scholarships.

Several programs authorized under title VII focus on promoting primary care education and training. By funding family practice, general internal medicine, and general pediatrics residency programs and family practice departments in medical schools, title VII has provided modest but crucial support for primary care training. (See table II.1.)

Table II.1: Title VII Programs Supporting Medical Education and Primary Care Specialization

Fiscal year 1993

Program	Description	Outlays (in thousands)
Health Professions Analytical Program	Supports analytical and descriptive studies of the health professions, including evaluations and projections of the supply of health professionals by specialty and geographic location	$640
Health Professions Educational Research	Awards grants and contracts to conduct research on health professions issues, including the extent to which educational debt affects medical student specialty choice, and factors affecting selection of careers in primary care	1,112
Establishment of Departments of Family Medicine	Awards grants to allopathic or osteopathic medical schools to establish, maintain, or improve family medicine programs, including pilot testing of model curricula[a]	11,494
Graduate Training in Family Medicine	Supports residency programs for training physicians who will enter family medicine, including support for such trainees[a]	15,711
Predoctoral Training in Family Medicine	Supports programs, trainees, curriculum development, clerkships, and preceptorships[a]	1,797
Faculty Development in Family Medicine	Supports family medicine programs and trainees in such programs who plan to teach in a family medicine training program[a]	6,403

(continued)

[58]The federal government contributes to the financing of graduate medical education also through programs administered by the Department of Veterans Affairs, the Department of Defense, and through federal sharing of states' costs of the Medicaid program. By funding biomedical research at the undergraduate and graduate medical education levels, the National Institutes of Health indirectly contributes to the financing of medical education and training.

[59]In addition to medicine, title VII provides federal support for health professions education in osteopathy, dentistry, veterinary medicine, optometry, podiatry, pharmacy, public health, and graduate programs in health administration.

Fiscal year 1993

Program	Description	Outlays (in thousands)
Graduate Training in General Internal Medicine and General Pediatrics	Supports new residency positions or conversion of "traditional" programs to those that emphasize longitudinal, preventive, and comprehensive care (unlike programs in internal medicine and pediatrics from which many physicians enter subspecialty training, supported programs emphasize continuity, ambulatory, and preventive medicine)[a]	11,587
Faculty Development in General Internal Medicine and General Pediatrics	Helps meet the cost of programs for training physicians who plan to teach in general internal medicine and general pediatrics, and for trainees in such programs[a]	4,892
Predoctoral Training for General Internal Medicine and General Pediatrics	Supports programs, trainees, curriculum development, clerkships, and preceptorships[a]	580
Primary Care Loan Program (formerly Health Professions Student Loans, as applied to schools of allopathic and osteopathic medicine)	Provides low-interest, need-based loans for students who specialize in primary care and practice primary care throughout the life of the loan (borrower's failure to honor agreement results in interest rate of 12% instead of 5%, and 3-year repayment deadline)[b,c]	
Exceptional Financial Need Scholarship	Funds awards of need-based, tuition scholarships to medical students who must complete residency training in primary care and practice in primary care for 5 years	10,331
Financial Assistance for Disadvantaged Health Professions Students (FADHPS)	Same as program above for students who must come from disadvantaged backgrounds	6,181

[a]Preference will be given to institutional applicants that demonstrate a commitment to train primary care clinicians and underrepresented minority students, and that have a high rate of students who go into practice in medically underserved areas.

[b]Participating schools must meet specified standards for output of primary care physicians or return a portion of the loan funds made available to the school. Schools that fail to meet certain conditions will be required to repay a percentage of Primary Care Loan Program funds received during the 1-year period in which the school did not comply.

[c]The Primary Care Loan and Health Professions Student Loans programs are supported by revolving funds. In fiscal year 1993, $1.9 million dollars were available for redistribution.

Source: U.S. Department of Health and Human Services, Public Health Service, Health Resources and Services Administration.

Although not focused on primary care, several other programs authorized under title VII complement efforts to promote primary care education and training. These programs include efforts to increase the numbers of health care providers from minority or disadvantaged backgrounds and to promote educational strategies to recruit and retain health care providers for underserved populations. Special loan and scholarship programs for disadvantaged and minority students reflect the perception that a

disproportionate number of such students enter primary care and practice in underserved areas.

Title III of the Public Health Service Act also provides support for improving access to care in "Health Professional Shortage Areas" through the National Health Service Corps.[60] These shortage areas can be designated based in part on a lack of primary care physicians. The Corps funds salary and benefit costs of program physicians, a variety of clinical and professional support activities, and scholarship and loan repayment programs. In fiscal year 1993, the federal government provided a total of about $116 million (about $43 million for field operations and about $73 million for recruiting and associated activities) to support the Corps and its programs.

[60]In 1981, authority for the National Health Service Corps Scholarship Program was transferred to title III by Public Law 97-35.

Survey Methodology for Medical School and Residency Surveys

Using survey methodology, we sought to measure the extent to which medical schools and residency programs maintain requirements and provide opportunities for students and residents to gain experience in primary care medicine.

Survey of Allopathic and Osteopathic Medical Schools

To determine how much primary care experience medical schools provide students, we mailed questionnaires to all 126 allopathic and 15 osteopathic medical schools in the United States. Specifically, we sought to determine the extent to which schools required observation or training in primary care medicine as part of their curricula.

We developed two self-administered questionnaires (for allopathic schools and for osteopathic schools) based on a review of relevant research and interviews with medical school officials. We pretested the questionnaires with participants from three medical schools and submitted copies to AAMC for review. Based on the pretest results and discussions with the reviewers, we modified and finalized the questionnaires and mailed them to the dean of each allopathic and osteopathic medical school. To obtain a higher response rate, we mailed a second questionnaire to nonrespondents. About 89 percent (112) of allopathic medical schools responded and 100 percent of osteopathic medical schools responded.

Survey of Residency Programs

To determine the extent to which residents are exposed to primary care medicine, we mailed questionnaires to 534 directors of allopathic and osteopathic residency programs. The survey sought to determine residents' contact with primary care medicine by reviewing aspects of three components of residency training: required rotations, elective rotations, and continuity of care assignments.

We developed items for the survey with the input of directors and department chairs from several residency programs. Based on these discussions, we developed eight self-administered questionnaires. While the questionnaires were similar in content, the response choices were tailored to fit five allopathic and three osteopathic residency programs. The allopathic programs included[61]

[61]A program was considered to be a "primary care track" program if it either advertised in the National Resident Matching Program as a primary care program or received funds from the federal Health Resources and Services Administration to support a primary care curricular focus within its residency program. We included as "traditional track" those programs that were listed in the National Resident Matching Program as categorical programs.

- internal medicine, traditional track,
- internal medicine, primary care track,
- pediatrics, traditional track,
- pediatrics, primary care track, and
- family practice.

The osteopathic programs included

- internal medicine,
- pediatrics, and
- general practice.

We pretested the questionnaires with representatives from nine residency programs (eight allopathic and one osteopathic). Pretest participants included hospital department chairs, residency program directors, and faculty members. We also submitted the questionnaires to several experts for review. On the basis of the pretest results and expert discussion, we modified and finalized the questionnaires.

We identified the universe of civilian residency programs for each of the five allopathic and three osteopathic program categories through listings in The 1991-1992 Directory of Graduate Medical Education Programs and The 1991-1992 Directory of Osteopathic Postdoctoral Education Programs. The residency programs selected to participate in the survey were identified through simple random sampling of the following residency programs: allopathic internal medicine, traditional track; internal medicine, primary care track; pediatrics, traditional track; family practice; and osteopathic general practice.[62] The entire population of osteopathic internal medicine and pediatrics programs and allopathic pediatrics primary care track programs was included in the study because of their relatively small numbers nationally.

About 82 percent (482) of the 534 program directors surveyed responded to the questionnaires. Response rates for each are listed in table III.1.

[62]Because we surveyed a statistical sample of these residency programs, our estimates have a measurable precision or sampling error. In this analysis, the sampling errors are stated at a 95-percent confidence level.

Table III.1: Percentage of Residency Programs Responding to Survey by Discipline and Track

Residency program discipline and track	Total number of programs	Number surveyed	Percentage of sample responded
Allopathic			
Internal medicine, traditional track	247	151	75
Internal medicine, primary care track	152	108	82
Pediatrics, traditional track	163	113	85
Pediatrics, primary care track	41	41	83
Family practice	367	76	84
Osteopathic			
Internal medicine	43	43	86
General practice	97	48	83

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Bibliography

Allen, S.S., and others. "Effects of Early Exposure to Family Medicine on Students' Attitudes Toward the Specialty." Journal of Medical Education, Vol. 62, (1987), pp. 911-17.

Association of American Medical Colleges. Financing Graduate Medical Education: Final Report of The AAMC Committee on Financing Graduate Medical Education. Washington, D.C.: 1986.

Babbott, D., and others. "The Stability of Early Specialty Preferences Among U.S. Medical School Graduates in 1983." Journal of the American Medical Association, Vol. 259 (13), (1988), pp. 1970-975.

Babbott, D., and others. "Racial-Ethnic Background and Specialty Choice: A Study of U.S. and Medical School Graduates in 1987." Academic Medicine, Vol. 64 (10), (1989), pp. 595-99.

Babbott, D., and others. "Medical Student Attitudes About Internal Medicine: A Study of U.S. Medical School Seniors in 1988." Annals of Internal Medicine, Vol. 114, (1991), pp. 16-22.

Campos-Outcalt, D., and J.M. Senf. "Characteristics of Medical Schools Related to the Choice of Family Medicine as a Specialty." Academic Medicine, Vol. 64, (1989), pp. 610-15.

Colwill, J.M. "Where Have All The Primary Care Applicants Gone?" New England Journal of Medicine, Vol. 326 (6), (1992), pp. 387-93.

Council on Graduate Medical Education. Fourth Report: Recommendations to Improve Access to Health Care Through Physician Workforce Reform. U.S. Department of Health and Human Services, Jan. 1994.

Duerson, M.C., and others. "Impact of Required Family Medicine Clerkship on Medical Students' Attitudes about Primary Care." Academic Medicine, Vol. 64, (1989), pp. 546-48.

Eisenberg, J.M. "How Can We Pay for Graduate Medical Education in Ambulatory Care?" New England Journal of Medicine, Vol. 320 (23), 1989, pp. 1525-531.

Feltovich, J., and others. "Teaching Medical Students in Ambulatory Settings in Departments of Internal Medicine." Academic Medicine, Vol. 64, (1989), pp. 36-41.

Ganem, J.L., and others. "Review of U.S. Medical School Finances, 1992-1993." Journal of the American Medical Association, Vol. 272 (9), (1994), pp. 705-11.

Ginzberg, E., and others. The Economics of Medical Education. New York: Josiah Macy Foundation, 1993.

Godkin, M., and M. Quirk. "Why Students Choose Family Medicine: State Schools Graduating the Most Family Physicians." Family Medicine, Vol. 23, (1991), pp. 521-26.

Goldsmith, G. "Factors Influencing Family Practice Residency Selection: A National Survey." The Journal of Family Practice, Vol. 15 (1), (1982), pp. 121-24.

Goodson, J.D., and others. "The Training of Physicians Outside the Hospital." Archives of Internal Medicine, Vol. 146, (1986), pp. 1805-809.

Greer, D., and others. "Comments on the AAMC Policy Statement Recommending Strategies for Increasing the Production of Generalist Physicians." Academic Medicine, Vol. 69 (4), (1994), pp. 245-60.

Huntington, C., and others. "The Shortage of Generalist Physicians." American Family Physician, Vol. 45 (4), (1992), pp. 1573-576.

Institute of Medicine. Primary Care Physicians: Financing Their GME in Ambulatory Settings. Washington, D.C.: National Academy Press, 1989.

Kassebaum, D.G., and R.A. Haynes. "Relationship Between Third-year Clerkships in Family Medicine and Graduating Students' Choices of Family Practice Careers." Academic Medicine, Vol. 67 (3), (1992), pp. 217-19.

Kassebaum, D.G., and P.L. Szenas. "Rural Sources of Medical Students, and Graduates' Choice of Rural Practice." Academic Medicine, Vol. 68 (3), (1993), pp. 232-36.

Kassebaum, D.G., and P.L. Szenas. "The Declining Interest Of Medical School Graduates in Generalist Specialties: Students' Abandonment of Earlier Inclinations." Academic Medicine, Vol. 68 (4), (1993), pp. 278-80.

Kassebaum, D.G., and P.L. Szenas. "Relationship Between Indebtedness and the Specialty Choices of Graduating Medical Students: 1993 Update." Academic Medicine, Vol. 68, (1993), pp. 934-37.

Kassebaum, D.G., and P.L. Szenas. "Factors Influencing the Specialty Choices of 1993 Medical School Graduates." Academic Medicine, Vol. 69, (1994), pp. 164-70.

Kassler, W.J., and others. "Why Medical Students Choose Primary Care Careers." Academic Medicine, Vol. 66 (1), (1991), pp. 41-43.

Lieu, T.A., and others. "Specialty Choices at One Medical School: Recent Trends and Analysis of Predictive Factors." Academic Medicine, Vol. 64, (1989), pp. 622-29.

Markert, R.J. "Why Medical Students Change to and from Primary Care as a Career Choice." Family Medicine, Vol. 23 (5), (1991), pp. 347-50.

Martini, C.J.M., and others. "Medical School and Student Characteristics That Influence Choosing a Generalist Career." Journal of the American Medical Association, Vol. 272 (9), (1994), pp. 661-68.

McKay, N.L. "The Economic Determinants of Specialty Choice by Medical Residents." Journal of Health Economics, Vol. 9, (1990), pp. 335-57.

McLaughlin, M.A., and others. "The Impact of Medical School Debt on Postgraduate Career and Lifestyle." Academic Medicine, Vol. 66 (9 Supplement), (1991), pp. S43-S45.

Nobel, J., and others. "Career Differences Between Primary Care and Traditional Trainees in Internal Medicine and Pediatrics." Annals of Internal Medicine, Vol. 116 (6), (1992), pp. 482-87.

Politzer, R.M., and others. "Primary Care Physician Supply and the Medically Underserved: A Status Report and Recommendations." Journal of the American Medical Association, Vol. 266 (1), (1991), pp. 104-09.

Rabinowitz, H. "The Relationship Between Medical Student Career Choice and A Required Third-year Family Practice Clerkship." Family Medicine, Vol. 20, (1988), pp. 118-21.

Rivo, M.L., and others. "Defining the Generalist Physician's Training." Journal of the American Medical Association, Vol. 271 (19), (1994), pp. 1499-504.

Rivo, M.L., and D. Satcher. "Improving Access to Health Care Through Physician Workforce Reform." Journal of the American Medical Association, Vol. 270, (1993), pp. 1074-078.

Rosenblatt, R.A., and others. "Which Medical Schools Produce Rural Physicians?" Journal of the American Medical Association, Vol. 268 (12), (1992), pp. 1559-565.

Rosenthal, M.P., and others. "Influence of Income, Hours Worked, and Loan Repayment on Medical Students' Decision to Pursue a Primary Care Career." Journal of the American Medical Association, Vol. 271 (12), (1994), pp. 914-17.

Schroeder, S.A. "The Making of a Medical Generalist." Health Affairs, Vol. 4 (2), (Summer 1985), pp. 22-96.

Schwartz, M.D., and others. "Medical Student Interest in Internal Medicine. Initial Report of the Society of General Internal Medicine (SGIM) Interest Group Survey on Factors Influencing Career Choice in Internal Medicine." Annals of Internal Medicine, Vol. 115, (1991), pp. 6-15.

Singer, A.M. The Class of [illegible]: A Follow-up Study of 1985 Medical School Graduates Through the First Six Postgraduate Years. Washington, DC: Health Resources and Services Administration, 1990.

Starfield, B. Primary Care: Concept, Evaluation, and Policy. New York: Oxford University Press, 1992.

Stimmel, B. "The Crisis in Primary Care and the Role of Medical Schools." Journal of the American Medical Association, Vol. 268 (15), (1992), pp. 2060-065.

U.S. General Accounting Office. Medicare: Graduate Medical Education Payment Policy Needs to Be Reexamined. GAO/HEHS-94-33, May 5, 1994.

Weiner, J. "Forecasting the Effects of Health Reform on U.S. Physician Workforce Requirement: Evidence from HMO Staffing Patterns." Journal of the American Medical Association, Vol. 272 (3), (1994), pp. 222-30.

Whitcomb, M.E., and others. "Comparing the Characteristics of Schools that Produce High Percentages and Low Percentages of Primary Care Physicians." Academic Medicine, Vol. 67, (1992), pp. 587-91.